Salem Benferhat
Philippe Besnard (Eds.)

LNAI 2143

Symbolic and Quantitative Approaches to Reasoning with Uncertainty

6th European Conference, ECSQARU 2001
Toulouse, France, September 2001
Proceedings

Springer

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Proceedings

Springer

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Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Symbolic and quantitative approaches to reasoning with uncertainty : 6th European conference ; proceedings / ECSQARU 2001, Toulouse, France, September 19 - 21, 2001. Salem Benferhat ; Philippe Besnard (ed.). - Berlin ; Heidelberg ; New York ; Barcelona ; Hong Kong ; London ; Milan ; Paris ; Singapore ; Tokyo : Springer, 2001
(Lecture notes in computer science ; Vol. 2143 : Lecture notes in artificial intelligence)
ISBN 3-540-42464-4

CR Subject Classification (1998): I.2, F.4.1

ISBN 3-540-42464-4 Springer-Verlag Berlin Heidelberg New York

Springer-Verlag Berlin Heidelberg New York
a member of BertelsmannSpringer Science+Business Media GmbH

http://www.springer.de

Printed in Germany

Typesetting: Camera-ready by author, data conversion by PTP-Berlin, Stefan Sossna
Printed on acid-free paper SPIN: 10840193 06/3142 5 4 3 2 1 0

Lecture Notes in Artificial Intelligence 2143

Subseries of Lecture Notes in Computer Science
Edited by J. G. Carbonell and J. Siekmann

Lecture Notes in Computer Science
Edited by G. Goos, J. Hartmanis, and J. van Leeuwen

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Preface

These are the proceedings of ECSQARU 2001, the Sixth European Conference on Symbolic and Quantitative Approaches to Reasoning with Uncertainty held in Toulouse, France, on September 19-21, 2001. The series started ten years ago in Marseilles, host of ECSQARU 1991, and went to Granada (ECSQARU 1993), Fribourg (ECSQARU 1995), Bad Honnef (ECSQARU/FAPR 1997), and London (ECSQARU 1999).

In addition to the contributed papers (selected from over a hundred submissions from 23 countries), the scientific program of ECSQARU 2001 included three invited talks: H. Geffner, F. V. Jensen, and T. Schaub. We would like to thank Patrice Perny and Alexis Tsioukias for organizing a special session on decision, and Rui Da Silva Neves for organizing a session on studies about uncertainty from the point of view of psychology. All papers in these two sessions have gone through the regular reviewing process and are included in this volume.

Moreover, three workshops were held prior to the conference itself: "Management of uncertainty and imprecision in multimedia information systems" (Mohand Boughanem, Fabio Crestani, Gabriella Pasi), "Spatio-temporal reasoning and geographic information systems" (Robert Jeansoulin, Odile Papini), and "Adventures in argumentation" (Anthony Hunter, Simon Parsons). Also, ECSQARU 2001 was co-located with ESI 2001, the Euro Summer Institute on Decision Analysis and Artificial Intelligence.

We are most grateful to the members of the program committee and all the additional reviewers for their work. We are indebted to all the members of the organizing committee for their support, which included setting up and maintaining Web pages. We would especially like to thank Colette Ravinet, Jean-Pierre Baritaud, and Max Delacroix for their help.

June 2001

Salem Benferhat
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1 Introduction

Over the last decade, graphical models for computer assisted diagnosis and decision making have become increasingly popular. Graphical models were originally introduced as ways of decomposing distributions over a large set of variables. However, the main reason for their popularity is that graphs are easy for humans to survey, and most often humans take part in the construction, test, and use of systems for diagnosis and decision making. In other words, at various points in the life cycle of a system, the model is interpreted by a human or communicated between humans. As opposed to machine learning, we shall call this activity human interacted modeling. In this paper we look at graphical models from this point of view. We introduce various kinds of graphical models, and the comprehensibility of their syntax and semantics is in focus.

2 Belief Graphs

We are faced with a particular part of the world. We already have some information that leads us to certain beliefs, and when we get new information, we update these beliefs. We organize the world into a set of *variables*. The possible values of variables are called *states*. The state set of variable A is denoted s_A.

Our belief is quantified as a set of real numbers. There are several belief calculi. Most prominent are probability calculus, fuzzy logic, and belief functions. The examples in this paper are taken from probability calculus, but the considerations are not restricted to this. The uncertainty calculus is expressed through *potentials* with sets of variables as their domains: for a set $\boldsymbol{X}$ of variables, the probability calculus defines a space, $sp(\boldsymbol{X})$, and a potential over $\boldsymbol{X}$ is a real-valued function over $sp(\boldsymbol{X})$. For probability calculus, $sp(\boldsymbol{X})$ is the Cartesian product of the state sets, and for belief functions, $sp(\boldsymbol{X})$ is the power set over this Cartesian product.

Definition 1. *A* belief graph *is a pair (Γ, Φ). Γ is a graph (Ω, Λ) with Ω being a set of variables and Λ a set of links. Links may be directed or undirected. Φ is a set of potentials. The domains of the potentials are subgraphs of Λ.*

S. Benferhat and P. Besnard (Eds.): ECSQARU 2001, LNAI 2143, pp. 1–15, 2001.